ADDRESS

OF

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PRESIDENT OF THE AMERICAN ASSOCIATION FOR THE YEAR 1851,

ON RETIRING FROM THE DUTIES OF PRESIDENT.

On retiring from the office of President of the American Association for the Advancement of Science, I submit, in conformity with usage, to its members, a few remarks in relation to the circumstances attending its organization, and to its progress, and some considerations of the direction in which we may look for its greatest usefulness.

The condition of society and of science of the day seems to have called for the organization of general associations for the promotion and advancement of science in nearly every country where its cultivators are numerous, zealous, and not closely gathered in one community; the precursors of more general unions for the same good purpose. To render such meetings practicable, modern facilities of communication are indispensable; and when these shall have brought Berlin and New-York as near as were Berlin and Paris at the close of the last century, we may pass from our present organization to something characteristic of the day of railroads and the dawn of telegraphs.

As the want seems to have been universally recognized, so it has been modified essentially by circumstances. In Germany, the cultivators of science have met in a social way, communicated, and dispersed. In Great Britain, an imposing permanent organization has kept the British Association always active, even when not together. Our own Association has scarcely developed a decided track: its end, the advancement of science; but the road to that end, left to the results of reconnoissance widely made on each side of the beaten path, to explore new ways around or through the obstacles.

Such associations cannot stimulate into being a Newton or a Cuvier; but who can say how much more they would have enabled Newton and Cuvier to do, by removing the load of opposition to their discoveries, by bringing up the cultivators of science as a body at once to the level of their knowledge, and by causing many minor lights to shine for the benefit of the time, either by reflection, or by the enkindling of new flame from their influence? Who will say that they do not return wiser, better, more zealous according to knowledge, from a meeting with Arago, with Humboldt, with Gauss, with Brewster, with Faraday, and their compeers; or, to come nearer home, with Henry, Peirce, or Agassiz? A man must be beyond improvement, indeed, whom such companionship will not benefit.

But is it true that genius is beyond or above the stimulus of association? Let the man among us who has, if ever man had the true "divine breath," tell us, in simple and single-heartedness, whether he left *that* meeting of the British Association the same man who went there; whether the effect of that simple and single figure on the blackboard, which showed to the geologists of the day discoveries to be made, founded on principles which created a new era in classification, was limited to his auditors, or even to cultivators of science through whom they spread with lightning rapidity and vividness: did it not react on him?

If such associations bring out only common men, it is because there are none others within their sphere of influence. Men of genius are still emphatically men, and of all others susceptible most truly of human and humanizing influences. Of them emphatically it may be said, if they will not say it for themselves, *Homo sum, et nil humanum alienum me puto.* The world is made up of ordinary men, and it is the part of common sense not to despise their doings. The specimens collected or the observations made by the humblest geologist who ever wielded a hammer, or the meekest astronomer who ever noted a transit, serve as part of the foundation of the superb structure raised by Von Buch, or by Leverrier. If the zeal of second-rate men is warmed into activity and directed in its development by such influences, the general level of science is raised by slow deposit, which may on occasion make mountains by upheaval. Associations are not proposed as a panacea, but only in cases needing a moderate stimulant: they appeal to some of the strongest and best motives of our nature.

Let us now briefly and rapidly glance at the general condition of

science among us prior to and at the time of the formation of our Association, the obstacles which were presented to its organization, and the mode of its formation.

In the colonial period of our country, the professors of mathematics and natural philosophy corresponded with the leading scientific men of Great Britain, some of them intimately : they looked for assistance in their pursuits (chiefly those of astronomy) to them, and for direction when special occasions of interest rendered their co-operation desirable. Winthrop of Massachusetts, and Rittenhouse of Pennsylvania, had the full advantage of such communion. At a later day, Franklin, Canton and Priestley, were intimates, and corresponded familiarly.

The generation which grew up during our revolutionary struggle, and after our independence was acknowledged, naturally did not succeed to these connections or friendships. The prosecution of mathematics and physical science was neglected; indeed barely kept alive by the calls for boundary and land surveys of the more extended class, by the exertions necessary in the lecture room, or by isolated volunteer efforts. As the country was explored and settled, the unworked mine of natural history was laid open, and the attention of almost all the cultivators of science was turned towards the development of its riches. Descriptive natural history is the pursuit which emphatically marks that period. As its exponent, may be taken the admirable descriptive mineralogy of Cleveland, which seemed to fill the measure of that day, and be as it were its chief embodiment, appearing just as the era was passing away.

I do not propose to attempt tracing the influences which have turned attention in America to a wider and deeper pursuit of natural, physical, and mathematical science. What we are here, at any time, lies more in present circumstances than in past history; and we share the general movement of the time, without those strongly conservative powers which in other countries exist in institutions of science and learning of a past day. The calls for mechanical knowledge, and for the applications of physics, of mathematics, and of natural science, have, without a doubt, thrown us irresistibly into the career which we are now following, and which, in its objects, aims and results, partakes of the general direction of the science of the world. The beginning of this movement was well nigh stifled by empiricism in forms, and in a strength which threatened the very life of science. Emboldened by the absence of accredited tribunals to

try its claims, it proffered boldly its pretensions to public notice, calling itself by the respected name of science, and to outward seeming entitled to its use.

In a small country town of France, as the worshippers were pouring from the cathedral church, I saw drawn up on the public square on which the building fronted, a large barouche, transformed for the time into a stage, from which a man, in a dress imitating that of the court of the last century, invited the issuing worshippers to try his skill in pharmacy, in medicine and in surgery, while a trumpet sounded occasionally appropriate "alarums" to call attention to the master charlatan. This was the old-fashioned character, hardly deceiving any but the most ignorant, though, withal, exhibiting a power of tooth-drawing such as would have challenged admiration had it been real. Our charlatans carefully doffed the dress, and laid aside the tools and stage, and their trumpet was blown by the spectators. They pretended, nevertheless, like him of the village, to that which they did not know; and invited, like him, the examination of powers which they did not possess. Had this association originated at that time, they would have usurped its seats, and outvoted the devotees of science in the election of its officers. This picture may seem overcharged; but I appeal for the essential truth of its features to the fears, which cannot yet be forgotten, of those who shrunk for many years from an organization, lest with the form of science it should want its spirit. The strife, though not a public and avowed one, has not been the less strenuous; and if renewed from time to time, the ground gained by true science is too well occupied by defensive works to render any new attack of avail. Our real danger lies now from a modified charlatanism, which makes merit in one subject an excuse for asking authority in others, or in all; and, because it has made real progress in one branch of science, claims to be an arbiter in others. Sometimes this authority is thrust on men who, not having the force to enlighten those who press them as to their real claims, injure the cause they would fain promote, by being too impressible. Merit thus moulded assumes the form of the impressing body. Whether the authority be seized or accepted, it is unlawful; the usurpers wear the shoes and buckles, if not the whole costume. This form of pretension leads men to appeal to tribunals for the decision of scientific questions, which are in no way competent to consider them; or to appeal to the general public voice from the decisions of scientific men or scientific tribunals, in matters

which, as they only are in possession of the knowledge necessary to make a right decision, so they only can give one which is valid. In a country where every thing is free, and every one may obtain a hearing, notoriety is often dearly purchased by the sacrifice of some portion of real reputation. Let us firmly discountenance the wearing even of buckles. If, even, we would count reputation by votes alone, the voice of *one* man of science is sure to be followed by *many* votes from the general throng.

The absence of a minute subdivision in the pursuit of science, the prevalence of general lecturing on various branches, the cultivation of the literature of science rather than of science itself, has produced many of the evils under which American science has labored, and which are now passing away. You have so much ground to clear, said an intelligent foreigner, that you cannot give all your time to one garden spot. We, though still farmers, begin to garden. While a general knowledge of various branches of science is useful in developing even a single branch, it is still certain that subdivision is essential to advancement. An Admirable Crichton rather fixes attention on his *own* perfection, than perfects any art.

Lecturing and the pursuit of science have, with us, up to this time, been very closely connected. It has been necessary to teach, and generally to lecture, in order to obtain means to pursue research; and the advantage which results from investigation is even now not so clearly seen as it ought to be by those who direct our institutions: they have yet, in many cases, to learn that the real estimate of a professor's services is not always the number of his hours on the college roster. Lecturing is, of all the arts, one of the most easily acquired, at least by our countrymen: it is undoubtedly useful, and most agreeable, but should not be the object and end of a man's career. It is not necessary to found institutions especially for its encouragement; nor should the power to diffuse science in successful courses of lectures be considered as a substitute for exertion in its advancement. One of the best lecturers in the world, confessedly so, made as great a failure in his first attempt as there is on record; and no one could detect the germ of one of our most brilliant lecturers in the unpromising envelope presented at a first lecture.

I remember well the chilling effect produced upon me, when young, by the remark of one of our leading literary men, applied to a distinguished scientific writer, that he was not a "mere *dry* man of science." The remark was intended for advice, and I pondered

over it. Perhaps I did not despise dryness as I ought; for the observation was drawn out by my unwillingness to undertake a notice of the first volume of Bowditch's Mécanique Céleste, some ten days after it appeared. Delighted with the idea of having the rich stores of that incomparable volume placed within the reach of a reader of the differential and integral calculus, I thought it profaneness to pretend to have read it in so brief a time. The immortal work was noticed by a more rapid reader. It was not then, and is not now, the prevailing fault of our science to be dry; nor is dryness one of the tendencies of our Association. I have sometimes thought there was danger of the opposite.

There is nothing more marked in different countries than the difference in facility of expression. Nothing certainly struck me with more force than the contrast between the happy fluency with which the Irish men of science brought out their ideas, and the difficulty which marked the expression of thought by their brethren on the other side of the channel. Some of the most brilliant discussions which I heard were in the French Academy, where the absence of dryness certifies that dryness is not, as in bitter reflection I may have supposed, a test of soundness.

The world's philosopher, Humboldt, speaks of the "self complacent diffuseness" of Aristotle; and if the Stagirite could show it in writing, we may well pardon it in oral communications. Manner is sometimes the index of mental workings, but not always. Much self-reliance may exist under a modest exterior, as apparent forwardness of manner may coëxist with a modest opinion of one's self. Let us be tolerant, unless we see the buckles.

When the effort was first made to establish a general American Association for the promotion of science, it is certain that it met with considerable opposition. There were various reasons for this. From close communication with many who are now active members of the Association, I know why this fear prevailed over their hopes of the usefulness of such an institution. The opposition came not more from those who were habitually conservative, than from those who, being earnest in regard to the progress of science, are usually in favor of all progressive measures. It proceeded from no under-estimate of the strength which there was among the cultivators of science. Some of us had studied the workings of the British Association, and had been convinced of the absolute necessity for the attendance there from year to year of the men of the universities, to give a tone to the

proceedings; and were alarmed, perhaps, at the forays into the domain of science, which had there been witnessed in some of the less powerful sections, and even into the park of Section A itself. So far from having been trained in the same schools, we scarcely knew each other personally. How could we irregulars venture into conflict, when the files to our right and to our left were strangers to us, and when the cause might thus have suffered from the want of discipline of its volunteer support?

It was very prudently left for the geologists to begin the work. In looking back, I see no reason to regret that such counsels prevailed. The geological surveys making in several States rendered meetings of those engaged in them very necessary, for comparison, discussion, systematic effort; for counsel, aid, and mutual improvement. A classification, or the basis of one, was to be made; and only by discussion, in such a body, could it be formed. In that association, positive work was the test of consideration: to be heard, a man must have *done* something; and the more he had done, the more patiently he was listened to. Thus, far deeper, morally, than the comparative depths which they explore, the geologists laid the foundation of the American Association. The naturalists associated themselves with the nucleus thus afforded, and the association became one of geologists and naturalists. Chemistry occupied from the beginning a portion of the attention of the Association, in its necessary connection with geology; at first a small, then a more extended part. Meteorology, which the circumstances of our country have made necessarily one of the branches of physics most successfully pursued among us, assisted in the further development; and calling in the votaries of general physics and mathematics, the association was expanded to its present dimensions, and became the American Association for the Advancement of Science. May the care thus taken in gradually raising the edifice from a firm foundation, secure its long duration!

I propose now, though conscious that the discussion must be a very limited and imperfect one, to add a remark to what has already been said on the benefits of associations like our own, to discuss the special advantages of our meetings; pointing out, as well as I may, those directions most likely to lead to our object, and some which I think, however alluring, should not be followed. But first a few observations on the ordinary modes of promoting science; in connexion with which, I would throw out for your consideration some

reasons which induce me to believe that *an institution of science, supplementary to existing ones, is much needed in our country, to guide public action in reference to scientific matters.*

One of the modes apart from education, by which, by common consent, everywhere science has been promoted, has been by the organization of societies for holding meetings, and publishing transactions and proceedings. Local institutions of this sort exist in all parts of the civilized world, sometimes endowed by the government, sometimes by individuals, and sometimes supported by voluntary contributions. To affirm that these institutions are not useful, would be to contradict universal experience : to withdraw our support from them, because they had failed to do all the good desirable, would be utopian. The present condition of science in France is in a great degree due to its Institute, which took the place of a less effectively organized body, when the nation determined to be the immediate patron of science. The departments have their societies, and some, as those of Lille and Lyons, with considerable vitality. In Great Britain, there is no large town without its philosophical or natural history society ; and in all the more important cities, there are as many societies as prominent departments of scientific research. In London, the subdivision is still more minute, and some branches have more than one association devoted to their advancement. Science cannot, in its writings of research, appeal to the mass of general readers ; and must be furnished, by association or endowment, with even its means of publication. Applied science is profitable in a pecuniary sense ; but abstract science, on which the other hangs, is not remunerating. Yet how many applications flow from one principle ! The world would gain, in a very high ratio, by bestowing its rewards for principles, instead of for applications.

With us, two philosophical societies only have struck very deep and wide their roots : the American Philosophical Society of Philadelphia, and the American Academy of Boston ; and several societies for the encouragement of natural history have been permanently useful. Not one of these associations is well endowed. For our only endowed national institution (the Smithsonian), we are indebted to the liberality of a foreigner ; and had it fivefold its present endowment, it would not be able to meet the actual demands upon its funds for purposes embraced in what its learned Secretary has classed as its "active operations" for "the increase and diffusion of knowledge."

The Institute of France gives its members a moderate support, that the country may have the benefit of their labors. The other institutions afford means for the publication of researches, but not, usually, for making them; nor, except incidentally in the persons of their officers, do they support their members. The means furnished for educational purposes are those generally which enable the votaries of abstract science to live. Where there are richly endowed universities and colleges, governed by the academic body itself, the facilities thus afforded are so extended as to require few others. Where institutions depend mainly upon the fees of pupils for their support, or, being endowed, are governed by those who take narrow views of the labors of scientific men, the professors are so loaded down with labor that neither body nor mind is capable of effective research. How very many there are who want only time and means for research, to advance those departments in which they now merely impart the doings of others! Will not a more healthy tone of opinion arise in time on this subject, from our intercommunication, and the candid expression of temperate and mature opinions?

Some of our institutions, and prominently among them the Franklin Institute of Pennsylvania, have furnished means for experiments on important subjects, and enlisted their most zealous members in researches; but even here the laborers were without hire, though neither they nor their works were deemed unworthy of it. Some of these researches remain to this day unpublished, from the necessary withdrawal of the members to other spheres of active exertion requiring all their time and thought; and will, if they have not already, become obsolete by the progress of the branches to which they belong. Among the obstacles to the progress of science with us, must be reckoned, as one of the largest, the want of direct support for its cultivators as such.

It is, I believe, a common mistake, to associate the idea of academical institutions with monarchical institutions. We show in this, as in many other things, the prejudice of our descent. We have among us the two extremes of exaggerated nationality and of excessive imitation: let us modify each by the other, and be wise. A national institute is not necessary to Great Britain, with her rich and powerful universities. Republican France has cherished her Institute, seeking rather to extend than to curtail its proportions. One of the most ardent of republicans is its perpetual secretary — that setting sun, whose effulgence shows that it is merely passing below the horizon

to illuminate another sphere! Nor does the idea of a necessary connexion between centralization and an institution strike me as a valid one. Suppose an institute of which the members belong in turn to each of our widely scattered States, working at their places of residence, and reporting their results; meeting only at particular times, and for special purposes; engaged in researches self-directed, or desired by the body, called for by Congress or by the Executive, who furnish the means for the inquiries. The detail of such an organization could be marked out so as to secure efficiency without centralization, and constant labor with its appropriate results. The public treasury would be saved many times the support of such a council, by the sound advice which it would give in regard to the various projects which are constantly forced upon their notice, and in regard to which they are now compelled to decide without the knowledge which alone can ensure a wise conclusion. The men of science who are at the seat of government either constantly or temporarily, are too much occupied in the special work which belongs to their official occupations, to answer such a purpose; besides, the additional responsibility which, if they were called together, they must necessarily bear, would prove too great a burthen, considering the fervid zeal, and I might almost say fierceness, with which questions of interest are pursued, and the very extraordinary means resorted to to bring about a successful conclusion. If it were admissible that I should go into detail on this subject, I could prove the economy of a permanent consulting body like this. This is, however, a lower view than the saving of character by avoiding mistakes and misdirection of public encouragement, and by loss of opportunity of encouraging that which is really useful. I should subject the Association to some criticism if I unfolded this subject specifically, particularizing the errors here generally alluded to; and I abstain, merely remarking that the amount which would have been saved to one department of the government alone, from the application of the principle of the equality of action and reaction, would have supported such a council for twenty years, including the furnishing of means to show experimentally the applications of the principle to the case in question. Not only in new undertakings would the advice of such a body be most important, but they would be appealed to for information in regard to existing ones, and would prove most serviceable in advising in doubtful points.

Our country is making such rapid progress in material improve-

ment, that it is impossible for either the legislative or executive departments of our Government to avoid incidentally, if not directly, being involved in the decision of such questions. Without specification, it is easy to see that there are few applications of science which do not bear on the interests of commerce and navigation, naval or military concerns, the customs, the light-houses, the public lands, post-offices and post-roads, either directly or remotely. If all examination is refused, the good is confounded with the bad, and the Government may lose a most important advantage. If a decision is left to influence, or to imperfect knowledge, the worst consequences follow.

Such a body would supply a place not occupied by existing institutions, and which our own is, from its temporary and voluntary character, not able to supply.

Astronomy, chiefly at first from its connection with navigation, has been the science which all governments, our own inclusive, have selected to encourage; fostering thus one of the highest branches of theoretical science, on account of its practical applications. It may be truly said that we know more of the laws which govern the motions of the distant bodies of the universe, than we do of those which regulate the constitution of bodies around us. Would not the same results, or assuredly similar ones, flow from a systematic encouragement for a long period of any one branch of science? The experiment is certainly worth trying.

If meteorology could be encouraged with a world-wide patronage, like astronomy, what practical and theoretical results would not be derived? The results of even the partial effort made in behalf of magnetism and meteorology, is encouraging: brief as the term has been, the materials are gathered, or gathering, from which important conclusions are daily derived, and which await the master mind to weave into new "Principia," a new "Mécanique," or a new "Theoria."

Every man of genius seems, on setting out from the mental level where education and circumstances have placed him, to be capable of a certain amount of effort in his "journey to the stars," and no more. Even animal natures are educated to view railroads without fright, first, and then without emotion, even of curiosity. No professor of physics lives that studies his pupils, who has not been disappointed at some time, after the elaborate preparation of a new experiment, to find how coldly it was looked upon: it was new to him; but to

his class all was new, and the same level included the motion of a needle by the galvanic current, and the magnetism of oxygen. The next generation will start from the level of the steamboat, the railroad, the phototype, and the telegraph.

It has seemed abroad, and with us in the United States, that something more was wanting to keep up the healing motion in the waters of science, than was obtained from the existing institutions already alluded to; that without interfering with their useful labors, good was to be gained by bringing their members together in one general association, holding its meetings in different places, in part to give facilities for attendance to different persons in turn, and in part to stimulate local exertion by the influence, so important in social as well as chemical action, of *presence*. Are such associations destined to an enduring existence, or are they only to be temporary in their action? Is their animation to be life-long, or to be from time to time suspended? If the want which they supply is temporary, they will have spring-time, summer, and winter. If, having fulfilled their end, they pass into other forms of institutions better adapted to the wants of science, we will not regret their longer or shorter life, nor hold them less in veneration that they died. The good they may do, cannot be lost.

Separated by vast distances, scattered in larger or smaller communities, the daily avocations of men of science in the United States keep us asunder. Our small numbers at any one point produces all the bad influences of isolation. We feel cut off from the world of science, and sink discouraged on account of the isolation; or having a position in the community about us, we become content to enjoy this, and forget that we owe a duty to the world outside; that we ought to increase, as well as to diffuse; to labor, as well as to enjoy the labor of others. Our country asks for other things from us than this; and men of science of this day will, as in times past, labor for progress. We will hope to have "American methods" in the other branches of science, besides practical astronomy.

If these associations have proved themselves of value in other countries, and have commanded the support of all their most active and eminent men of science so as to continue their meetings year after year, there is none where they could have promised to be so important to the interests of national science as in the United States. Organization here, for good or for evil, is the means to the end. While science is without organization, it is without power: power-

less against its enemies, open or secret; powerless in the hands of false or injudicious friends. Not wedded to existing forms, this country is alive to everything which promises improvement; and the public mind, in this or that place, or in the whole country, made almost a physical point by the electric telegraph, runs irresistibly in one course, the result of wise or evil counsels, of knowledge or half-knowledge. Honor to that great statesman who, passing beyond the limits of our political and social institutions, came forward on our national anniversary to direct the minds of the people in tracing the progress of our country by its education, its religion, its literature, and its science!

Many of our States are anxiously alive to the promotion of science, both directly and indirectly; and it is of the greatest importance, that in moving, they should go rightly. The legislative and executive branches of our General Government are called upon often to decide questions which belong rather to scientific than to political tribunals. A timely recommendation by a scientific congress would frequently be a relief from serious embarrassment, and ensure the most beneficial results to the progress of science. The abuse of such power is less to be expected in this than in other bodies, because reacting immediately upon the body itself. Thus far no single recommendation made by the American Association has fallen powerless: they have both done positive good, and averted positive evil.

In looking at the labors of associations like our own, we naturally desire to emulate them; and the spirit of imitation is second nature. We are prone to think, that what is well done, and successfully, by others, we should prove our ability to do; and that omission is a confession of inability. On a warm and sunny afternoon, I saw the company in a railroad car prepare a shade before leaving the depot, by raising the blinds on the east side, because some one who had his head turned set the example. The value of the example which we would emulate or imitate, may consist in the circumstance—on the side where the sun is.

Let us take up some of the leading objects to which other associations have usefully devoted their energies, and see whether they constitute leading marks for our course.

One of the most useful fruits of associated scientific labor is in making, directing, or furnishing the means and appliances for experimental researches. There is a class of experiments and observations, the plan of which can be laid out beforehand, and which it is

eminently the province of associations to undertake. The British Association has distinguished itself by directing such through committees, and considerable appropriations have been made for their necessary expenses. The fee of membership in that association is large; the number of members, very large : we cannot expect to emulate it in our pecuniary means. The treasury of our Association has been relieved by the liberality of the city of Charleston, and of the citizens of Cincinnati, from the cost of publishing the proceedings of the meetings; and yet it is very scantily supplied. Can we collect means for directing researches, unless from unlooked-for individual munificence? I think not. Nor do I see that working spirit in our committees, which alone could bring experiments to a successful conclusion. The Association disperses; the members separate, and there is no stimulus to apply to committees for the half or the whole year. Even the physical constants we have called for, have not been reported.

There is one subject in this connection, which I feel it my duty briefly to advert to. Painful though it be, it should not be passed by. I do not see, on the part of the younger members of the Association, that disposition which belongs to their time of life, to take the laboring oar in the details of our own work, and without which even the temporary labors of our meetings cannot be long borne. Perhaps, from modesty, they shrink from the responsibility. If so, let them be encouraged to do their part, in confidence that the desire to serve will be fully appreciated by the Association.

I cannot see that experimental researches, undertaken from its funds and executed by its committees, can successfully form part of the regular business of this Association.

These remarks I do not at all apply to cases where, means being furnished by public or private munificence, the question is merely to direct a plan of operations. We can, assuredly, to advantage, direct the researches of others by suggesting what it is desirable to do, or how it should be done. If experiments on the change of level of our coast, on the sediments of rivers and estuaries and the like, are desired by geologists; if special collections are desired by our naturalists, and there are public works to which these matters appropriately belong, or private individuals who desire to see them carried through, this Association is a very proper body to suggest the observations and to furnish instructions.

The standing committee of the Association, and others organized

to act during the meetings, have always done much work. The members devote themselves to the Association sedulously during the days of meeting. Why not limit ourselves generally to those subjects and matters which our committees can transact during the period of meeting, and why not give time for committees to deliberate? Do we not press matters too much, for the interest of the Association? After close observation, I believe that we do. We ought to allow ourselves time to do well what we undertake.

The same course of reasoning would lead me to the same conclusions in regard to computations to be made under the direction of the Association; another field of usefulness, which the British Association has fully entered into, attaching its name to the most extended and best arranged catalogue of the stars which has yet been published.

If we would attempt reports on the progress of science like those which were so perseveringly and admirably kept up by the illustrious Secretary of the Swedish Academy, or like those which have emanated from the committees and members of the British Association, we are on preoccupied ground, with disadvantages of position and of pecuniary resources. Not only must we compete in our own language abroad, but with an institution at home (the Smithsonian), which, finding this field of usefulness untilled among us, has fully entered upon it. This career of usefulness is, except on special occasions, not open to us.

The objects of our Association are to be considered as they act directly to increase the amount of scientific knowledge, or indirectly by the effect on the associates who attend the meetings, or the communities where they are held.

Without a published record of our doings, the effect of our Association would be limited to the members who attended the meetings, and the importance of publishing has been recognized in the informal arrangements from year to year in reference to it. The zeal of the local committees at Charleston and Cincinnati not only relieved the Association from the expense of publishing the volumes, but carried them rapidly through the press. To the local secretary at Charleston, Prof. Lewis R. Gibbes, and the permanent secretary of the Association, Prof. Spencer F. Baird, we are indebted for the promptness with which the volumes of the Charleston and New-Haven meetings appeared. When the meetings are merely annual, there will be time, it is hoped, to permit authors carefully to examine

the proofsheets of their papers, without which dispatch is gained at the expense of accuracy.

It is hardly possible that the publication of our proceedings should interfere with the transactions of other learned societies. Our materials consist essentially of abstracts or of brief communications, of accounts of researches often in progress, and notes which differ entirely from the elaborate memoirs appropriate to such transactions. The memoirs of learned societies, with us, have always been published at considerable intervals of time; and I am not aware that the intervals have been increased since our organization. There is unmistakable evidence in the activity of the American Journal of Science, that we do not interfere with it.

At our meetings have been presented 338 communications; of which, 107 have been on subjects of physics and mathematics, 32 on chemistry, 93 on geology and mineralogy, 83 on natural history in its various branches (especially zoology), and 23 on miscellaneous subjects.

For these publications, I am of opinion that we have drawn in part from material which had accumulated: we have consumed more than the supply of the year would furnish, and will at last, when thrown upon the results of a single year, find our proceedings less abundantly supplied than hitherto. Still, while our gatherings are numerous as now, and similarly constituted, there will be interesting matter and to spare. Matters in progress will be brought before us, the full results of which will be published elsewhere.

But, have any papers or memoirs been actually produced by these meetings, which would not, without them, have been brought before the public? Of this I entertain not the least doubt. Indeed, I know many which, without the stimulus of preparation for these meetings, would not have seen the light; some, which, in fact, could not appriately have been brought forward elsewhere. The desire to add to the interest of the meetings, has been a powerful stimulus to exertion on the part of many. This will continue, perhaps, intermittingly; but, as localities change, and new members attend the meetings, the average may remain nearly constant. Papers have been produced, which otherwise might not have appeared. We are posted up to the very day of meeting in the researches actually making in natural, physical, and mathematical science. At the Cambridge and New-Haven meetings, physico-mathematics had the leading part; at Charleston, natural history, and especially zoology; at Cincinnati,

geology and its kindred branches. Each meeting was characterized by communications of a very high order of interest; each as distinctly characterized as the part of the country in which it was held; each one excellent in its way, exhibiting (like our union) unity in diversity.

For the good effect, from our meetings, on local science, I appeal unhesitatingly to those who have been with us since the new organization. We know that such good has resulted. We can point to those who have found new motives to research in attending our meetings. We can point to one institution, founded and endowed in part through our action on public sentiment. May we be able, also, at no distant day, to say of another which is an ornament to the last noble city where we assembled, that it too has been endowed in consequence, at least in part, of our influence.

There are some subjects which only an association like this is competent to grapple with : the subject of regulating standards of weights and measures, and the scales of barometer and thermometer, and the prime meridian, are of this kind. There is now no other scientific body to point out explorations desirable to be made on land or water, to suggest systems of extended meteorological observation, plans of surveys, geographical, geological, or others.

Congress, after changing the money standard and regulating the coinage, seems to have stopped short, and, after a long agitation of the subject of standard weights and measures, to have left it in very weariness. The whole effort towards uniformity has simply been to prepare material standards of a quality according with the demands of the science of the day : pounds, yards, bushels and gallons conforming to the general average of those in common use, and derived from England; and putting aside innovations in the commonly received units, their multiples or sub-multiples. I have been gratified to see a spirit of inquiry on this subject alive among the members; believing that nowhere can essential changes or reforms in the whole system be more fairly or powerfully discussed, than here. An individual, unless perhaps some leading legislator, who would propose changes at this time in our country on this subject, would but waste his time and logic.

The Association determined in Cincinnati to fix a time for the discussion of this subject at the present meeting. Closely connected with it is the regulation of the various scales used with instruments, which depend on the unit of length measure, or arbitrary scales. I

hope to see a time set apart at this or some subsequent meeting for the discussion of this matter, which was partly opened at Cambridge by Prof. Guyot. The world is obviously ripening for a general settlement of these questions, and as intercommunication strengthens the advantage of one system of measures and weights, and of one general prime meridian, will gain strength with it. A collection of the weights and measures, the barometers and thermometers, and of the charts of navigation and nautical almanacs of each of the countries represented at the World's Fair, would have presented in strong relief the necessity for something better adapted to a world's use.

As far as these questions affect scientific men and science in the United States alone, they are absolutely within our control; and the recommendation of this body would undoubtedly lead to the adoption by our brethren of such standards of weight and measure, such linear unit for the scale of the barometer, and such scales for the thermometer as would be recommended. Those who use these standards would be the first to become familiar with them from actual sight and use; and I know the great ease with which one becomes used to measures and weights, the employment of which seems at first entirely strange.

If ever we may expect a combined series of meteorological observations with exact instruments and observers, whose *business* it shall be to make the observations, it must be in consequence of a recommendation of this Association. The stations should be selected so as to furnish the best results for climate and the laws of storms, and not left to the determination of circumstances foreign to the consideration of the object sought. If we could once communicate to New-York harbor the coming of a northeast storm in time to prevent vessels from leaving it, the full benefit of these researches would come home to the commercial community of the country, and means to extend the observations would be freely provided.

The recommendations already made by the Association have met with signal success. Among these I may note the appropriation for the publication of the report of Prof. H. D. Rogers on the geological survey of Pennsylvania, by the legislature of that State; the law for a geological survey of Ohio; of the scientific explorers attached to the Mexican Boundary Survey, under Commissioner Bartlett; and of the expeditions under charge of Lieut. Maury, for examining special questions connected with winds and currents.

It has been doubted whether it was expedient for the Association to give opinions on questions of science, and to report on scientific researches. These doubts I do not share, but believe, on the contrary, that if we decline so to do, we do not come up to the clear measure of our duty. Where the opinion of the Association is sought, it should fearlessly, frankly, but carefully be given. The fact that the researches are by one of its members will not excuse it for avoiding the task. Instead of stating in the approved formulary that it gives no opinion, I would have it guide opinion by forming its own mature conclusions, and giving them where desired with all the weight of its authority.

Whether the Association should be the arbiter of questions of priority occurring between its members, is much more doubtful in my mind. It would be of great value to scientific men to have such questions, which unhappily often arise, carefully and dispassionately settled. When both parties desire the arbitrement, I think it should be assumed, as a less evil than that of avoiding a decision where the facts are all presented. There is but one other course : rigorously to exclude all personal questions ; in which case, the Association decides that there is no tribunal for such, and drives its members to appeal to the public.

At the last annual meeting, the president of the year before was called upon to prepare a code of scientific ethics, the result of the clear principles laid down upon this subject in his address. Let us hope that he will contribute this code, which, like reputable men under the civil code, we will endeavor to live without violating; not considering it a law given to compel us to right, but rather as a line far within which we will walk.

In considering these meetings in reference to the effect on the individual members, we might claim them as a relaxation from severe labor; as an agreeable, intellectual resort, to learn the results of the day, did not our aims soar higher than this, and extend to substantial intellectual benefits to others as well as to ourselves.

That these meetings are, in the individual intercourse which they bring about, intellectually and morally beneficial, is most certain. The intellect is excited by such intercourse; the heart is expanded. Freedom and frankness of discussion, and the interchange of views and friendly criticism, have marked the meetings. If there have been exceptions, the shock that was produced has recalled better feelings, or better judgment. It is certainly true, that as far as a man's re-

searches and discoveries are comprehensible in his day, he receives full credit for them, especially if he ask little and is patient. Contention about priority, or contention at all, is as a general rule unnecessary; where it becomes personal, it disgusts, and reacts against him who indulges in the personality. It is difficult to avoid controversy; but, if obviously forced on one, the defence finds itself strong in sympathy. We have not been without examples of the good effect of submitting to scientific discussion and decision, pretensions, the reality of which the author did not, and could not doubt, but which had been doubted by others. What triumph greater than that of our Cincinnati brother, when the committee of the Association reported so strongly in favor of the admirable method of recording right ascensions and declinations. Truth triumphed through his love for it! What a triumph for American science, when the "American method" of observing is adopted at Greenwich! The contribution, by whomsoever made, by however many shared, is a contribution to the glory of the country. The generous award of credit to our country, by this name, by the illustrious astronomer of Greenwich, is not the less honorable to him than to us. Let us show ourselves worthy of the spirit, by sinking all personal views in a general contribution to the American method. If the Association is worth any thing, it should be adequate to this result: let it be the test.

To our meetings each member brings his contribution; gathered from the land or the sea, the earth, the air, the heavens, the spirit, each one lays his offering on the altar of truth. How little, when under the influence of this spirit, seem contentions for special lines of research, the interference in special pursuits, the covetous desire to enter a particular path, and the determination to jostle the votary who is following it, rather than not to occupy it exclusively. The realm is boundless; the paths are numerous: each one is wide.

Let there be no contention, brother, between thee and me! Let there be rather a generous and eager urging forward, each of the other, to the good which we all seek. Warmed by the glow of generous sympathy, let us find our zeal kept alive by association, and show that the bond of scientific brotherhood is worthy of christian men, in a christian land, of the faith which we profess in time and of our hope in eternity.